IFW $

PTO/SB/21 (09-04)

# TRANSMITTAL FORM

*(to be used for all correspondence after initial filing)*

| | |
|---|---|
| Application Number | 10/643,312 |
| Filing Date | August 18, 2003 |
| First Named Inventor | NAKAMURA, Yasuaki |
| Art Unit | 2186 |
| Examiner Name | Unassigned |
| Attorney Docket Number | 16869K-090400US |

Total Number of Pages in This Submission

## ENCLOSURES *(Check all that apply)*

- ☒ Fee Transmittal Form
  - ☐ Fee Attached
- ☒ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☒ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) _____
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) (please identify below):

Exhibit A - Search Report
Exhibit B - Table of Contents and 7 Refs.
Return Postcard

Remarks: The Commissioner is authorized to charge any additional fees to Deposit Account 20-1430.

## SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

| | | | |
|---|---|---|---|
| Firm Name | Townsend and Townsend and Crew LLP | | |
| Signature | | | |
| Printed name | George B. F. Yee | | |
| Date | May 20, 2005 | Reg. No. | 37,478 |

## CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

| | | | |
|---|---|---|---|
| Signature | | | |
| Typed or printed name | Cynthia McKinley | Date | May 20, 2005 |

60496989 v1

*Effective on 12/08/2004.*
*Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).*

# FEE TRANSMITTAL
## For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

| TOTAL AMOUNT OF PAYMENT | ($) 130 |
|---|---|

| *Complete if Known* | |
|---|---|
| Application Number | 10/643,312 |
| Filing Date | August 18, 2003 |
| First Named Inventor | NAKAMURA, Yasuaki |
| Examiner Name | Unassigned |
| Art Unit | 2186 |
| Attorney Docket No. | 16869K-090400US |

**METHOD OF PAYMENT** (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 20-1430 Deposit Account Name: Townsend and Townsend and Crew LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

☒ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☒ Credit any overpayments

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038**

**FEE CALCULATION**

**1. BASIC FILING, SEARCH, AND EXAMINATION FEES**

| | FILING FEES | | SEARCH FEES | | EXAMINATION FEES | | |
|---|---|---|---|---|---|---|---|
| | | Small Entity | | Small Entity | | Small Entity | |
| Application Type | Fee ($) | Fee ($) | Fee ($) | Fee ($) | Fee ($) | Fee ($) | Fees Paid ($) |
| Utility | 300 | 150 | 500 | 250 | 200 | 100 | |
| Design | 200 | 100 | 100 | 50 | 130 | 65 | |
| Plant | 200 | 100 | 300 | 150 | 160 | 80 | |
| Reissue | 300 | 150 | 500 | 250 | 600 | 300 | |
| Provisional | 200 | 100 | 0 | 0 | 0 | 0 | |

**2. EXCESS CLAIM FEES**

| Fee Description | Small Entity Fee ($) | Small Entity Fee ($) |
|---|---|---|
| Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent | 50 | 25 |
| Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent | 200 | 100 |
| Multiple dependent claims | 360 | 180 |

| Total Claims | Extra Claims | Fee ($) | Fee Paid ($) |
|---|---|---|---|
| _____ | -20 or HP = _____ | x _____ | = _____ |

HP = highest number of total claims paid for, if greater than 20

| Indep. Claims | Extra Claims | Fee ($) | Fee Paid ($) |
|---|---|---|---|
| _____ | -3 or HP = _____ | x _____ | = _____ |

HP = highest number of independent claims paid for, if greater than 3

| Multiple Dependent Claims | |
|---|---|
| Fee ($) | Fee Paid ($) |
| _____ | _____ |

**3. APPLICATION SIZE FEE**

If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

| Total Sheets | Extra Sheets | Number of each additional 50 or fraction thereof | Fee ($) | Fee Paid ($) |
|---|---|---|---|---|
| _____ - 100 = | _____ / 50 = | _____ (round **up** to a whole number) | x _____ | = _____ |

**4. OTHER FEE(S)**

| | Fees Paid ($) |
|---|---|
| Non-English Specification, $130 fee (no small entity discount) | |
| Other: Petition Fee | 130 |

**SUBMITTED BY**

| Signature | | Registration No. (Attorney/Agent) 37,478 | Telephone 650-326-2400 |
|---|---|---|---|
| Name (Print/Type) | George B. F. Yee | | Date May 20, 2005 |

60496983 v1

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to:

On 5/20/05

TOWNSEND and TOWNSEND and CREW LLP

By:

PATENT
Attorney Docket No.: 16869K-090400US
Client Ref. No.: 627 / SM /ss
Hitachi Ref. No.: 340201235US01

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of:

Yasuaki Nakamura et al.

Application No.: 10/643,312

Filed: August 18, 2003

For: Disk Control System and Control Method of Disk Control System

Customer No.: 20350

Confirmation No. 4217

Examiner: Unassigned

Technology Center/Art Unit: 2186

PETITION TO MAKE SPECIAL FOR NEW APPLICATION PURSUANT TO 37 C.F.R. § 1.102(d) & M.P.E.P. § 708.02, Item VIII, ACCELERATED EXAMINATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is a petition to make special the above-identified application in accordance with MPEP § 708.02, Item VIII, accelerated examination. The application has not received any examination by the Examiner.

(A) The Commissioner is authorized to charge the petition fee of $130 under 37 C.F.R. § 1.17(h), and any additional fees that may be associated with this petition may be charged to Deposit Account No. 20-1430.

(B) All the claims are believed to be directed to a single invention. If the examiner determines that all the claims presented are not obviously directed to a single invention, then Applicant will make an election without traverse as a prerequisite to the grant of special status where the specific grouping of claims will be determined by the examiner.

(C) A pre-examination search was performed by an independent patent search firm. A copy of the search report is provided herewith as Exhibit A. The pre-examination search includes a classification search, a computer database search, and a keyword search. The searches were performed on or around April 5, 2005. The classification search covered Class **707**, subclass 1 and Class **711**, subclasses 113, 114, 154, 165, and 203. Additionally, a keyword search was performed on the USPTO full-text database, including published applications. The following references were identified in the search report:

(1) U.S. Patent Nos.:

| | |
|---|---|
| 6,532,527 | Selkirk et al. |
| 6,697,866 | Arakawa et al. |

(2) U.S. Patent Application Publication Nos.:

| | |
|---|---|
| 2001/0020254 | Blumenau et al. |
| 2002/0143793 | Voigt |
| 2003/0159058 | Eguchi et al. |
| 2003/0191734 | Voigt |
| 2004/0143832 | Yamamoto et al. |

(D) The above references are enclosed herewith, collectively as Exhibit B.

(E) Set forth below is a detailed discussion of the references, pointing out with particularity how the claimed subject matter recited in the claims, amended according to the preliminary amendment filed herewith, is distinguishable over the references.

**Claimed Subject Matter of the Present Invention**

Independent claim 1 recites a disk control system that receives a process command for writing or reading of data from an information processing device. The process command specifies a logical unit. The disk control system performs a write or read process of data with a logical device corresponding to the logical unit. The disk control system manages logical devices which are logical storage regions defined (set) on a storage region of a disk drive. A correspondence between logical devices and logical units is maintained in the disk control system. When a process command specifies a logical unit that has no corresponding logical device, then a logical device is assigned to the logical unit. The process command is then

performed. The disk control system further will not assign a logical device to the specified logical unit if the process command does not cause a process with regard to a logical device. As explained on page 5, lines 18-25 in the specification as originally filed, a process command that does not cause a process with regard to a logical device refers to a command which can be performed on a logical unit even thought the logical unit is not associated with a logical device.

Independent claim 10 recites a control method for disk control system which manages logical devices defined on a storage region of a disk drive and maintains a correspondence between logical devices and logical units. When a process command (e.g., an I/O command) is received that specifies a logical unit, then a determination is made whether a logical device is assigned to the logical unit. If so, then the process command is performed with regard to the logical device. If not, then a logical device is associated with the specified logical unit and the process is performed with regard to that logical device.

Independent claim 11 recites a control method for disk control system which manages logical devices defined on a storage region of a disk drive and maintains a correspondence between logical devices and logical units. The disk control system receives a process command (e.g., an I/O command) that specifies a logical unit. If a logical device is assigned to the logical unit, then the process command is performed with regard to the logical device. If a logical device is not assigned to the specified logical unit and the process command does not cause a process with regard to the logical device, then the process command is performed without assigning a logical device to the specified logical unit. If no logical device has been assigned to the specified logical unit and the process command causes a process with regard to the logical device, then the logical device is assigned to the logical unit and the process command is performed.

**U.S. Patent No. 6,532,527 Selkirk et al.**

The patent to Selkirk et al. (6,532,527), assigned to Storage Technology Corp., provides for Using Current Recovery Mechanisms to Implement Dynamic Mapping Operations. Disclosed is storage subsystem 200 that is a shared virtual array. Each physical storage device 202 in subsystem 200 may be represented to a data processing system such as client 108 as a

number of virtual devices. A method for data unit/virtual device structure data processing methodology is presented. Data unit/VDS requirements interpretation is processed (step 506) and the data units/VDS requirements are processed to map methodologies for implementation (step 508). Virtual data units are communicated to the storage subsystem 200 or subsystems (step 512). Each storage subsystem creates a logical device structure to map the virtual data unit (step 514). Management interface 516 can manage data unit requirements inventory 522 and storage methodologies inventory 518. Interface 516 can also receive and provide input from/to stage subsystem capabilities inventory 520 (see figures 1, 2, 5; column 4, lines 48-52; column 8, lines 5-8, 12-19).

Selkirk et al., as understood, do not appear to show determining that a logical device has not been assigned to a specified logical unit and then assigning a logical device to the specified logical unit, during the course of processing of a process command.

Selkirk et al., moreover, do not appear to show determining whether or not to assign a logical device to a specified logical unit based on whether a received process command causes a process with regard to the logical device.

**U.S. Patent No. 6,697,866 Arakawa et al.**

The patent to Arakawa et al. (6,697,866), assigned to Hitachi, Ltd., provides for Access Control Method for Data Stored in Fixed-block Length Format in Computer Configurations Utilizing Variable Length Data format Interfaces. Disclosed is a method for increasing data transfer performance during read and write operations on fixed block length formatted data. Figures 2 and 3 show read and write processing. Figure 5 shows a sequence chart for an access protocol to access data stored in FBL format.

There does not appear to be any discussion relating to determining that a logical device has not been assigned to a specified logical unit and then assigning a logical device to the specified logical unit, during the course of processing of a process command.

There also seems to be no discussion relating to determining whether or not to assign a logical device to a specified logical unit based on whether a received process command causes a process with regard to the logical device.

**U.S. Publication No. 2001/0020254 Blumenau et al.**

The patent application to Blumenau et al. (2001/0020254) provides for a Method and Apparatus for Managing Access to Storage Devices in a Storage System with Access Control. Disclosed is a method for managing access to a shared resource by a plurality of devices that are coupled to the shared resource via a network. The method includes receiving in a storage system a non-media request by a first device to access a logical device for which the first device has no data access privileges. A determination is made whether the first device is authorized to have non-media access to the logical device. If authorization exists then the non-media access request is permitted. Figure 3 shows a storage system 20 which includes a volume allocation component 72. See paragraph [0060].

Blumenau et al., as understood, do not appear to show determining that a logical device has not been assigned to a specified logical unit and then assigning a logical device to the specified logical unit, during the course of processing of a process command.

Blumenau et al., moreover, do not appear to show determining whether or not to assign a logical device to a specified logical unit based on whether a received process command causes a process with regard to the logical device.

**U.S. Publication No. 2002/0143793 Voigt**

The patent application to Voigt (2002/0143793) provides for a Method and Apparatus for Providing File System Access to a Disk Array. Disclosed is a virtual mapping component 302 in a disk array (figure 4). The virtual mapping component is responsible for creating and assigning logical units for data to be stored across device array 203a. RAID component 303 is responsible for managing storage device array 203a and for communications with the virtual array mapping component. RAID component 303 also implements data storage redundancy schemes or RAID schemes supported by storage system 201. (see figure 7; paragraph 30).

As understood, it does not appear that Voigt describes determining that a logical device has not been assigned to a specified logical unit and then assigning a logical device to the specified logical unit, during the course of processing of a process command.

In addition, it appears that Voigt does not show determining whether or not to assign a logical device to a specified logical unit based on whether a received process command causes a process with regard to the logical device.

**U.S. Publication No. 2003/0159058 Eguchi et al.**

The patent application to Eguchi et al. (2003/0159058), assigned to Hitachi, Ltd., provides for a Method of Performing Active Data Copying Processing, and Storage Subsystem and Storage Control Apparatus for Performing Active Data Copying Processing. Disclosed is a storage subsystem coupled to a computer, comprising: a logical storage device to which an I/O process is performed by the computer; a judgment unit which determines whether an access to the logical storage device is permitted or not, in accordance with a data copy instruction from the computer for a data copy process relative to the logical storage device. In the storage subsystem control unit 2200, upon reception of a read/write processing request for a physical storage device 2300, the logical/physical correspondence unit 2212 acquires a logical/physical correspondence by referring to the logical/physical storage area correspondence information 2211. The read/write unit 2210 performs a read/write processing relative to a proper storage area (see figure 2; paragraphs 26, 55).

Eguchi et al., as understood, do not appear to discuss determining that a logical device has not been assigned to a specified logical unit and then assigning a logical device to the specified logical unit, during the course of processing of a process command.

Eguchi et al., moreover, do not appear to describe determining whether or not to assign a logical device to a specified logical unit based on whether a received process command causes a process with regard to the logical device.

**U.S. Publication No. 2003/0191734 Voigt**

The patent application to Voigt (2003/0191734) provides for a Method and Program Product for Managing Data Access Routes in a Data Storage System Providing Multiple Access Routes. Disclosed is a virtual array mapping component 202 located in array controller processor 105 within data storage system 100 that provides array data management arrangement which relates data stored on storage devices 103 to logical units and to blocks of storage space. Virtual mapping component 202 can also be responsible for creating and assigning logical units for the data to be stored across the device array 102. RAID management component 203 is responsible for managing the storage device array 102 and for communications with the virtual mapping component 202. For a read operation, array mapping component 202 determines the block allocations associated with the pre-existing file to be read. In a write operation, mapping component 202 maps the file data to blocks within the logical unit assigned to the file (see figures 1, 2; paragraphs 23, 29, 42).

As understood, it does not appear that Voigt describes determining that a logical device has not been assigned to a specified logical unit and then assigning a logical device to the specified logical unit, during the course of processing of a process command.

In addition, it appears that Voigt does not show determining whether or not to assign a logical device to a specified logical unit based on whether a received process command causes a process with regard to the logical device.

**U.S. Publication No. 2004/0143832 Yamamoto et al.**

The patent application to Yamamoto et al. (2004/0143832) provides for a Storage Unit, Installation Method Thereof and Installation Program Therefor. Discussed is a control memory that stores programs executed by a processor. Various kinds of management information such as logical device management information 126 for management of logical devices of a second storage unit 12a can be stored in the control memory. Logical device management information 126 manages the logical devices within second storage unit 12a. A port number of the entry 25 is set with information indicating which port the logical device is connected with among a plurality of ports 123. A target ID and LUN are identifiers for

identifying a logical device. When a host computer 11 accesses the device on SCSI, the target ID and LUN are used as a SCSI-ID and LUN, respectively. The control memory of storage 12a or 12b holds management information on an attribute of a WWN and the like of each port 123 (see figure 2; paragraphs 37, 46, 48).

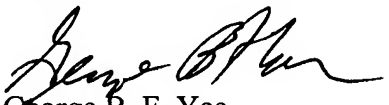
Yamamoto et al., as understood, do not appear to show determining that a logical device has not been assigned to a specified logical unit and then assigning a logical device to the specified logical unit, during the course of processing of a process command.

Yamamoto et al., moreover, do not appear to show determining whether or not to assign a logical device to a specified logical unit based on whether a received process command causes a process with regard to the logical device.

**Conclusion**

In view of this comments presented in the instant petition and the claim amendments presented in the accompanying preliminary amendment, the Examiner is respectfully requested to issue a first Office Action at an early date.

Respectfully submitted,



George B. F. Yee
Reg. No. 37,478

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Attachments
GBFY
60474691 v1

PATENT
Attorney Docket No.: 16869K-090400US
Client Ref. No.: 627 / SM / ss

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | |
|---|---|
| In re application of: | Confirmation No. 4217 |
| Yasuaki Nakamura et al. | Examiner: Unassigned |
| Application No.: 10/643,312 | Technology Center/Art Unit: 2186 |
| Filed: August 18, 2003 | PRELIMINARY AMENDMENT SUBMITTED WITH PETITION TO MAKE SPECIAL |
| For: Disk Control System and Control Method of Disk Control System | |
| Customer No.: 20350 | |

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In connection with the Petition to Make Special submitted herewith, please enter the following amendments and remarks:

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this paper.

**Remarks/Arguments** begin on page 5 of this paper.

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings of claims in the application:

**Listing of Claims:**

1. (Currently amended): A disk control system that receives a process command for writing or reading of data from an information processing device, and performs a write or read process of data with respect to a logical device corresponding to a logical unit specified by that process command, comprising:

means for managing, as units, logical devices, which are logical storage regions that have been set in a storage region provided by a disk drive;

means for storing a correspondence between said logical devices and logical units, which are storage regions that have been set logically; ~~and~~

means for assigning, when a process command has been received for a logical unit to which no logical device has been assigned, a logical device to that logical unit and performing processing with regard to that logical device; and

means for responding to said information processing device, when a process command that does not cause a process with regard to a logical device has been received from said information processing device, by performing a process corresponding to that process command without performing said assignment.

2. (Canceled)

3. (Original): A disk control system according to claim 1, further comprising:

means for assigning a plurality of said logical devices to one of said logical units; and

means for assigning to that logical unit only a number of said logical devices that is necessary in order to perform the processing corresponding to said process command.

4. (Original): A disk control system according to claim 1, further comprising:

means for sending to said information processing device a message indicating that said process command cannot be processed, if there is no logical device that can be assigned to said logical unit.

5. (Original): A disk control system according to claim 1, further comprising:

means for sending to said information processing device a message indicating that reading is impossible, if a process command requesting the reading of data from a logical unit to which no logical device has been assigned has been received from said information processing device.

6. (Original): A disk control system according to claim 1, wherein said information processing device is an open system computer.

7. (Original): A disk control system according to claim 1, wherein said process command of the disk control system is a SCSI command.

8 and 9. (Canceled)

10. (Original): A control method for a disk control system that manages, as units, logical devices, which are logical storage regions that have been set in a storage region provided by a disk drive, that stores a correspondence between said logical devices and logical units, which are storage regions that have been set logically, that receives a process command that has been sent from an information processing device, and that performs processing with regard to a logical device corresponding to the logical unit specified by that process command, the control method comprising:

a first step of receiving a process command for a logical unit;

a second step of determining whether a logical device has been assigned to that logical unit; and

if in said second step a logical device is assigned to said logical unit, a third step of performing with regard to that logical device a process corresponding to said process command, and, if in said second step no logical device is assigned to said logical unit, assigning a logical device to said logical unit and performing with regard that logical device a process corresponding to said process command.

11. (Original): A control method for a disk control system that manages, as units, logical devices, which are logical storage regions that have been set in a storage region provided by a disk drive, that stores a correspondence between said logical devices and logical units, which are storage regions that have been set logically, that receives a process command that has been sent from an information processing device, and that performs processing with respect to a logical device corresponding to the logical unit specified by that process command, the control method comprising, when a process command has been received for a logical unit:

if a logical device has been assigned to that logical unit, performing with regard to that logical device a process corresponding to that process command;

if no logical device has been assigned to that logical unit and that process command is a command that does not cause a process with regard to said logical device, performing a process corresponding to that process command without assigning a logical device to that logical unit; and

if no logical device has been assigned to that logical unit and that process command is a command that causes a process with regard to said logical device, assigning a logical device to said logical unit and performing with regard to that logical device a process corresponding to that process command.

## REMARKS/ARGUMENTS

Claims 1, 3-7, 10, and 11 are pending.

Claim 1 was amended to incorporate the subject matter of claim 2. Claim 2 has been canceled without prejudice or disclaimer.

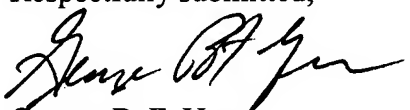
Claims 8 and 7 have been canceled without prejudice or disclaimer.

## CONCLUSION

All claims pending in this Application are believed to be in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



George B. F. Yee
Reg. No. 37,478

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GBFY
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# EXHIBIT A

Search Report for
Application No. 10/643,312; Filed August 18, 2003

**CONFIDENTIAL**
**(Patentability Search)**

## I. SEARCH FEATURE

A. General

Disk control system

B. Specific

A disk control system that receives a process command for writing or reading of data from an information processing device, and performs a write or read process of data with respect to a logical device corresponding to a logical unit specified by that process command, comprising:

> means for managing, as units, logical devices, which are logical storage regions that have been set in a storage region provided by a disk drive;
> means for storing a correspondence between said logical devices and logical units, which are storage regions that have been set logically; and
> means for assigning, when a process command has been received for a logical unit to which no logical device has been assigned, a logical device to that logical unit and performing processing with regard to that logical device.

C. Application

Disk array processing in a storage system

## II. FIELD OF SEARCH

The search of the above features was conducted in the following areas:

A. Classification search

| Class | Subclasses | Description |
|---|---|---|
| **707/** | | **DATA PROCESSING: DATABASE AND FILE MANAGEMENT OR DATA STRUCTURES** |
| | 1 | DATABASE OR FILE ACCESSING |
| **711/** | | **ELECTRICAL COMPUTERS AND DIGITAL PROCESSING SYSTEMS: MEMORY** |
| | 113 | ....Caching |

| Class | Subclasses | Description (continued) |
|---|---|---|
| | 114 | ....Arrayed (e.g., RAIDs) |
| | 154 | .Control technique |
| | 165 | ..Internal relocation |
| | 203 | ..Virtual addressing |

The above subclasses represent areas deemed to contain subject matter of interest to one or more of the search features. Please note that relevant references may be classified outside of these areas. The integrity of the search is based on the records as presented to us by the United States Patent and Trademark Office (USPTO). No further integrity studies were performed. Also a key word search was performed on the USPTO full-text database including published U.S. patent applications.

## III. RESULTS OF SEARCH

A. References developed as a result of search (related art is in boldface):

| U.S. Patent No. | Inventor |
|---|---|
| **6,532,527 B2** | **Selkirk et al.** |
| 6,697,866 B1* | Arakawa et al. |

| U.S. Patent Application Publication No. | Inventor |
|---|---|
| 2001/0020254 A1 | Blumenau et al. |
| **2002/0143793 A1** | **Voigt** |
| **2003/0159058 A1*** | **Eguchi et al.** |
| **2003/0191734 A1** | **Voigt** |
| **2004/0143832 A1** | **Yamamoto et al.** |

B. Discussion of related references in numerical order:

The patent to Selkirk et al. (6,532,527 B2), assigned to Storage Technology Corp., provides for *Using Current Recovery Mechanisms to Implement Dynamic Mapping Operations*. Disclosed is storage subsystem **200** that is a shared virtual array. Each physical storage device **202** in subsystem **200** may be represented to a data processing system such as client **108** as a number of virtual devices. A method for data unit/virtual device structure data processing methodology is presented. Data unit/VDS requirements interpretation is processed (step **506**) and the data units/VDS requirements are processed to map methodologies for implementation (step **508**). Virtual data units are communicated to the storage subsystem **200** or subsystems (step **512**). Each

storage subsystem creates a logical device structure to map the virtual data unit (step **514**). Management interface **516** can manage data unit requirements inventory **522** and storage methodologies inventory **518**. Interface **516** can also receive and provide input from/to stage subsystem capabilities inventory **520** (see figures 1, 2, 5; column 4, lines 48-52; column 8, lines 5-8, 12-19).

The patent application to Eguchi et al. (2003/0159058 A1), assigned to Hitachi, Ltd., provides for a *Method of Performing Active Data Copying Processing, and Storage Subsystem and Storage Control Apparatus for Performing Active Data Copying Processing*. Disclosed is a storage subsystem coupled to a computer, comprising: a logical storage device to which an I/O process is performed by the computer; a judgment unit which determines whether an access to the logical storage device is permitted or not, in accordance with a data copy instruction from the computer for a data copy process relative to the logical storage device. In the storage subsystem control unit **2200**, upon reception of a read/write processing request for a physical storage device **2300**, the logical/physical correspondence unit **2212** acquires a logical/physical correspondence by referring to the logical/physical storage area correspondence information **2211**. The read/write unit **2210** performs a read/write processing relative to a proper storage area (see figure 2; paragraphs 26, 55).

The patent application to Voigt (2003/0191734 A1) provides for a *Method and Program Product for Managing Data Access Routes in a Data Storage System Providing Multiple Access Routes*. Disclosed is a virtual array mapping component **202** located in array controller processor **105** within data storage system **100** that provides array data management arrangement which relates data stored on storage devices **103** to logical units and to blocks of storage space. Virtual mapping component **202** can also be responsible for creating and assigning logical units for the data to be stored across the device array **102**. RAID management component **203** is responsible for managing the storage device array **102** and for communications with the virtual mapping component **202**. For a read operation, array mapping component **202** determines the block allocations associated with the pre-existing file to be read. In a write operation, mapping component **202** maps the file data to blocks within the logical unit assigned to the file (see figures 1, 2; paragraphs 23, 29, 42) Note: Inventor related U.S. patent application 2002/0143793 is similar.

The patent application to Yamamoto et al. (2004/0143832 A1) provides for a *Storage Unit, Installation Method Thereof and Installation Program Therefor*. Discussed is a control memory that stores programs executed by a processor. Various kinds of management information such as logical device management information **126** for management of logical devices of a second storage unit **12a** can be stored in the control memory. Logical device management information **126** manages the logical devices within second storage unit **12a**. A port number of the entry **25** is set with information indicating which port the logical device is connected with among a plurality of ports **123**. A target ID and

LUN are identifiers for identifying a logical device. When a host computer **11** accesses the device on SCSI, the target ID and LUN are used as a SCSI-ID and LUN, respectively. The control memory of storage **12a** or **12b** holds management information on an attribute of a WWN and the like of each port **123** (see figure 2; paragraphs 37, 46, 48).

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# EXHIBIT B

Table of Contents and References for
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